

**SOURCE EVALUATION PLAN
FOR RFCA POINT OF EVALUATION SW027**

REVISION 3

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**U.S. Department of Energy
Rocky Flats Environmental Technology Site
Golden, Colorado**

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1. INTRODUCTION

This Plan for source evaluation is provided in accordance with the Final Rocky Flats Cleanup Agreement (RFCA) (Attachment 5, §2.4(B)) under "Action Determinations". This Plan addresses the July 22, 1998 Rocky Flats Environmental Technology Site (Site) report of 30-day moving averages for plutonium (Pu) water-quality results for the South Interceptor Ditch (SID). Reportable 30-day average values were measured at the Point of Evaluation (POE) monitoring location on the SID (referred to as SW027) for the period May 5, 1998 through May 25, 1998.¹

2. DATA SUMMARY

As specified in the Surface Water section of the Integrated Monitoring Plan (IMP), Site personnel evaluate 30-day moving averages² for selected radionuclides at RFCA POEs and Points of Compliance (POCs). Recent evaluations of water-quality measurements at POE surface-water monitoring location SW027 (see Figure 2-1) show values for Pu-239, 240 requiring reporting and source evaluation under the RFCA Action Level Framework. SW027 is located on the South Interceptor Ditch (SID) above (upstream of) the inlet to Pond C-2. Results for 30-day moving averages using available data at SW027 are summarized below in Table 2-1 and are also plotted in Figure 2-2.

Table 2-1. Water-Quality Information from SW027 for the Period: 10/1/96-5/25/98.

Location	Parameter	Date(s) 30-Day Average Required Reporting	Date(s) of Maximum 30-Day Average	Maximum 30-Day Average (pCi/L)	Volume Weighted Average for Water Year 1998 to Date ³ (pCi/L)
SW027	Pu-239,240	5/5/98 - 5/25/98 ^a	5/25/98 ^b	0.42 ^b	0.15

^a As of 5/25/98, values at SW027 required reporting under the RFCA Action Level Framework.

^b Subsequent sample results may change date and value of maximum 30-day average.

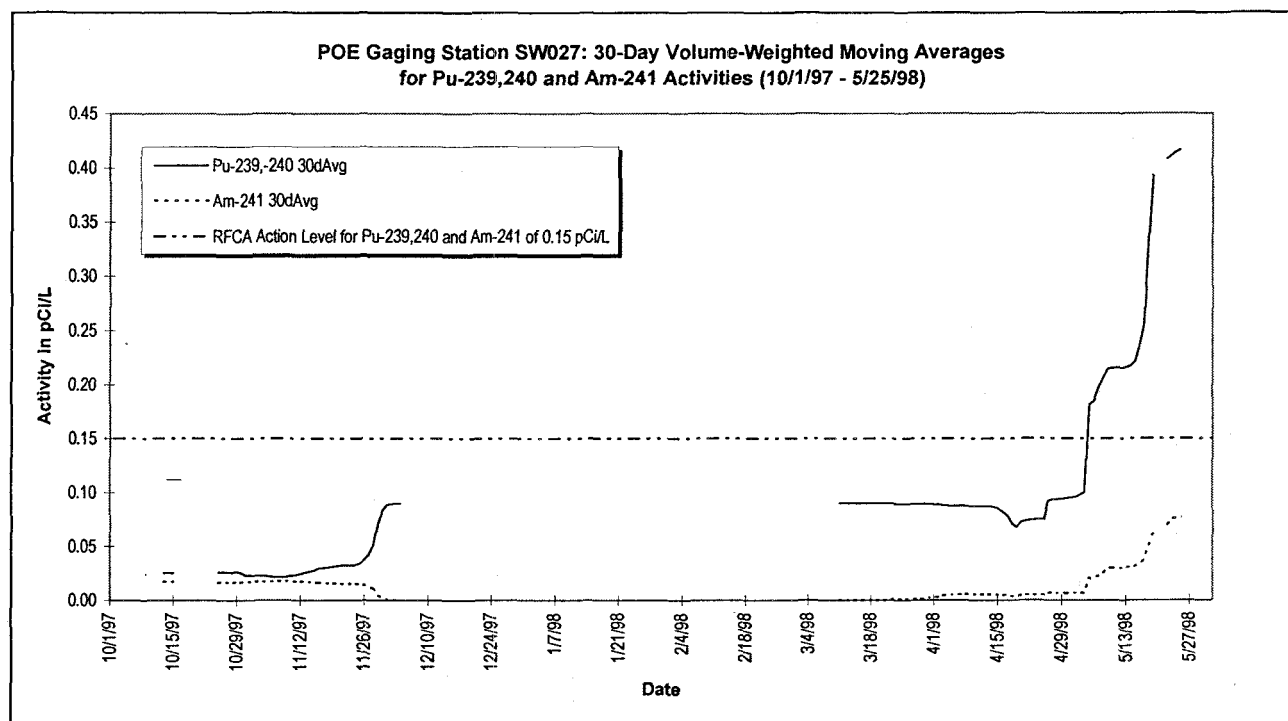
The laboratory narrative for the individual analytical results for the composite samples collected around the period of these reported 30-day averages have been reviewed and there is no reason to question the accuracy of these results. These results have not received formal third-party validation to date. A review of historical monitoring data shows that these results are not unusual. Storm-event and grab samples collected at SW027 from 1990 through 1996 (under pre-RFCA protocols) had an arithmetic average Pu-239,240 activity of 0.25 pCi/L with a maximum of 2.29 pCi/L. The apparent trend upward during WY98 is likely due to seasonally increasing flow rates and precipitation intensity which result in increased transport of suspended material. Individual composite sample results and details are shown in Table 2-2 for the period of interest.

¹ As of 5/25/98, 30-day average values at SW027 required reporting under the RFCA Action Level Framework.

² The 30-day average activity (pCi/L) for a particular day is calculated as a volume-weighted average of a 'window' of time containing the previous 30-days which had flow. Therefore, there are 365 30-day moving average values for a location which flows all year (366 in a leap year). For days where no activity is available, either due to failed lab analysis or non-sufficient quantity for analysis (NSQ), no 30-day average is reported.

³ A water year (abbreviated as WY) is defined as the period from October 1st through September 30th.

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Note: Gaps in the 30-day average above are for periods of zero flow at SW027.

Figure 2-2. Gaging Station SW027 30-Day Averages: WY98 to Date.

Table 2-2. Selected Composite Sample Analytical Results for SW027.

Composite Sample Period	Plutonium-239,240 (pCi/L)		Americium-241 (pCi/L)		Composite Sample Volume (Liters)	SID Discharge Volume During Sample Period (Million Gallons)
	Result	Error	Result	Error		
4/13 - 4/20/98	0.040	0.031	-0.004	0.026	19.2	2.72
4/20 - 4/30/98	0.204	0.065	0.016	0.030	19.4	1.3
4/30 - 5/8/98	0.802	0.156	0.124	0.051	9.4	0.73
5/8 - 5/26/98	0.333	0.115	0.106	0.073	10.6	0.86

Note: All composite samples listed above were of adequate volume for all required analyses.

The surface water measured at SW027 was subsequently detained in Pond C-2. This water was then batched and discharged from Pond C-2 during the period 5/21/98 through 5/30/98. Results from the predischage sample collected on 5/5/98 from Pond C-2 were 0.031 ± 0.006 pCi/L Pu. Analytical results for the composite samples collected at POC gaging station GS31 (Figure 2-1) during the C-2 batch discharge were within typical activity levels for that location. Table 2-3 summarizes these results. Additionally, analytical results from composite samples collected at POC GS01 (Figure 2-1) also show low radionuclide levels. Table 2-4 summarizes these results.

During this time period, no off-normal conditions were noted in decontamination and decommissioning (D&D), special nuclear material (SNM) stabilization, or environmental cleanup activities that may have affected water quality, nor were there any closure activities occurring in the SID drainage tributary to SW027.

This drainage does, however, contain areas of above-background surface-soil contamination, including the 903 Pad and Lip Area.

Table 2-3. Composite Sample Analytical Results for GS31: 5/21/98 - 5/30/98.

Composite Sample Period	Plutonium-239,240 (pCi/L)		Americium-241 (pCi/L)		Composite Sample Volume (Liters)	Pond C-2 Discharge Volume During Sample Period (Million Gallons)
	Result	Error	Result	Error		
5/21 - 5/24/98	-0.001	0.011	0.017	0.042	7.8	5.5
5/24 - 5/27/98	0.001	0.011	0.010	0.026	11.2	4.06
5/27 - 5/30/98	0.010	0.016	0.030	0.036	8.8	3.65

Table 2-4. Composite Sample Analytical Results for GS01: 5/21/98 - 5/30/98.

Composite Sample Period	Plutonium-239,240 (pCi/L)		Americium-241 (pCi/L)		Composite Sample Volume (Liters)
	Result	Error	Result	Error	
5/21 - 5/24/98	-0.005	0.004	0.003	0.021	4.6
5/24 - 5/27/98	0.009	0.015	0.000	0.024	6.0
5/27 - 5/30/98	0.007	0.018	-0.003	0.024	4.6

3. SOURCE EVALUATION FOR RFCA POE SW027

This Plan describes proposed source evaluation activities for the SID surface-water monitoring location POE SW027 (Figure 3-1). Source evaluations are performed to determine the location, extent, and significance of areas which may have an adverse impact on surface-water quality. Source evaluations may include analysis of constituent transport and loading, as well as the evaluation of water-quality correlations which may indicate the location of a contaminant source. A Source Evaluation Report will be produced based on an evaluation of existing data. A list of proposed SW027 Source Evaluation deliverables is provided in Section 4.

3.1. Continuation of RFCA Monitoring

Flow-paced sampling at SW027 and GS31, (Figure 3-1) will continue as specified by the Site IMP. These and future RFCA analytical information will be used to evaluate for trends in the 30-day moving average values at these locations. This information may indicate water-quality patterns which lend insight into the cause of the recent reportable values measured at SW027.

3.2. Walk-Down of Drainage Area

A walk-down of the SW027 drainage area (Figure 3-1) will be used in an effort to visually identify conditions which may indicate source areas. Conditions which might indicate a potential source area include the following:

1. Existence of man-made materials in drainage pathways;
2. Areas of concentrated fine sediments in drainage pathways;
3. Areas which contribute significant quantities of runoff sediment (e.g., steep dirt roads, barren hillsides, and slopes needing revegetation);
4. Erosion on radionuclide-related IHSSs;

1

5. Position of radionuclide-related IHSSs in relation to storm water drainage pathways; and
6. Overall condition of storm drainage pathways.

3.3. Assessment of Existing Environmental Data

Existing environmental information will be evaluated for trends and correlations which may indicate the locations of source areas. Fate, transport, and loading analyses will be performed where data is of sufficient quality and quantity. Each type of environmental information will be assessed both individually and in conjunction with any other information including water quality parameters which may provide insight. The evaluation for each information resource, as defined by the following subsections is detailed below.

3.3.1. Automated Surface-Water Monitoring Data

A complete data set will be presented of automated data collected under the Event-Related Surface-Water, Industrial Area IM/IRA, and RFCA/IMP Monitoring Programs at tributary gaging stations SW027, GS21, GS22, GS23, GS24, GS25, and GS42 (Figure 3-1).⁴ Summary statistics and data presented will include flow rates, discharge volumes, precipitation data, Pu and Am activities, TSS, and water quality parameters that may show correlation with the analytical results. Particular attention will be given to the various sampling protocols such that comparisons are meaningful. Calculations will be performed to estimate monthly, seasonal, and annual loading rates for Pu and Am, and the relative contributions of gaging stations tributary to SW027. Consideration will be given to other environmental variables which may influence water-quality such as time of year and storm-event characteristics.

3.3.2. Sitewide Surface-Water Data⁵

Existing data from Site surface-water characterization reports (e.g., Surface Water and Sediment Geochemical Characterization Reports) and monitoring reports (e.g., Event-Related Surface Water Monitoring Reports) will be compiled and evaluated. Additional historic surface-water radioanalytical data for locations tributary to SW027 will be extracted from the Site Soil/Water Database (SWD) and evaluated. The data set will be limited to data collected from 1991 through the present. Summary statistics, trend plots and maps will be prepared. This information will be presented with a qualitative discussion of data-set completeness, trend analysis, and relevance of any anomalous values as they relate to identifying potential sources of radiological contamination.

3.3.3. Gamma Spectroscopy Information

Data will be reviewed from the Industrial Area Operable Unit gamma spectroscopy survey, conducted in 1993 and 1994, that utilized High Purity Germanium (HPGe) detectors. The HPGe instrumentation was used to measure Americium-241 activities in Industrial Area surficial soil materials. Limitations of this analytical method will be recognized. The data set will be reviewed with consideration that building "shine" (from properly stored radioactive materials) can potentially impact results and that small, localized sources may be undetected.

⁴ Dates of operation are specific to each automated monitoring location. The intent is to make comparisons of averages for like time periods (i.e. monthly, seasonal, annual).

⁵ Sitewide surface-water data includes all surface-water sample results collected at the Site, regardless of project or method. Automated surface-water monitoring data is a sub-set of that data which, due to the method of collection, allows for more extensive evaluation.

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3.3.4. Data Generated by Recent Site Projects

Site closure activities being conducted upstream from SW027 at the time of, or just prior to, the period of interest will be investigated. Activities that could potentially impact surface water, including building D&D, SNM stabilization, environmental remediation projects, excavation work, and routine day-to-day operations, will be reviewed.

For each Site closure activity identified as potentially relevant to this investigation, the following information will be provided:

- Scope of activity;
- Contaminants of concern;
- Project-specific environmental monitoring data (where available);
- Project-specific engineering controls in place; and
- Administrative controls.

3.3.5. Soil and Sediment Information

Analysis of historical reports and data will provide the basis for the sediment and soils investigation. Existing reports on sediment and soils investigations will be compiled and reviewed for information which will aid the SW027 source investigation. Historical soil/sediment radioanalytical data for locations in the SW027 drainage will be compiled and analyzed. The data set will be limited to data collected from 1991 through the present. Summary statistics, trend plots, and maps will be prepared to aid the investigation. This information will be presented with a qualitative discussion of data set completeness, trend analysis, and relevance of any anomalous values as they pertain to potential SW027 radiological sources.

3.3.6. Historical Release Report Information

The Historical Release Report and its annual updates provide a listing of all known spills, releases, and incidents involving hazardous substances occurring since the Rocky Flats Plant began operations in the early 1950s. Based on information in this document, a summary of historic releases to the SW027 drainage and changes to this drainage will be compiled and assessed.

3.3.7. Groundwater Data

Subsurface water-quality data for groundwater wells in the vicinity of SW027 will be compiled and considered in relation to surface-water quality trends. The data set will be limited to data collected from 1991 through the present. Particular attention will be given to well installation and sampling techniques as they relate to the character of the samples and applicability of the results. Finally, any noteworthy trends in radiological subsurface-water quality upgradient from SW027 will be identified and considered. Summary statistics of the relevant information will be compiled and presented in conjunction with a qualitative discussion of possible relationships between groundwater quality and recent surface-water sampling results at SW027.

3.3.8. Assessment of Radiochemistry Quality Assurance

A review of the completed data packages for the individual reportable results from SW027 will be included in the report. This review will include an examination of the case narrative, any duplicate or control results and blanks as well as a comparison of the actual tracer recovery versus the required tracer recovery. All analytical data are verified by a third-party subcontractor to the Analytical Services Division (ASD). If verification is completed at the time of the Site's data package review, it will be noted in the report. Validation is also performed by the third-party subcontractor to ASD; and, to date, these samples have not been validated.

3.4. Actinide Migration Studies

The Site is currently involved in comprehensive multi-year Actinide Migration Studies (AMS) to improve understanding of the behavior and transport of actinides (esp. Pu, Americium, Uranium) in the environment. AMS will provide information about the nature of potential sources and the mobility of actinides in the Site environment. The major goals of AMS are to:

1. Assess the long-term protectiveness of the actinide soil action levels on surface water;
2. Design remedial actions that minimize actinide migration after Site closure and are protective of surface water quality; and
3. Understand the actinide environmental transport mechanisms by refining the Conceptual Model (see Attachment 1 of the Path Forward for Actinide Migration, June 1997).

A summary of activities related to POE SW027 will be included. Additionally, a summary of relevant findings from the Actinide Migration Studies that are available will also be included. On August 17-18, 1998, the Site will exchange information with the AMS Panel in meetings to be held at Jefferson County Airport. Transport mechanisms identified by the AMS will be used in the source evaluation to help locate potential source areas. The source evaluations will be conducted in cooperation with the investigators working on the AMS, and their expertise will be regularly solicited.

3.5. Watershed Improvements

Studies indicate that, when sources are available, radionuclides may associate with solids suspended in stormwater. Based on these characteristics of radionuclides and stormwater, it is inferred that removing particulate material from stormwater runoff should also remove radionuclide load. Watershed improvements have been implemented at RFETS in FY96 and FY97 in order to stabilize and entrap soils and sediments likely to be transported by stormwater runoff.

Watershed improvements implemented during the past two years in the drainage basin upstream from SW027 will be discussed. Surface water monitoring results from monitoring locations affected by these improvements will also be presented.

4. DELIVERABLES

The Site intends to deliver a single Source Evaluation Report for Point of Evaluation SW027. The content of the Report is detailed below, and the completion date is given in Section 5.

Should source evaluations be successful and indicate that control actions would be appropriate and also effective at significantly improving water quality, the Site will evaluate control options on a sitewide basis in conjunction with the Site's ER prioritization process. Appropriate source-control measures will be targeted and designed based on the results of the source evaluation. If source evaluations prove inconclusive, and additional reportable values are measured at SW027, then additional evaluation may be considered and a supplement to the Report would be produced. As part of such an effort, additional environmental data may be collected. The following will be included in this Report for POE SW027:

- A summary of walk-down activities and observations (see Section 3.2);
- Results and analysis of ongoing RFCA monitoring (see Sections 3.1 and 3.3.1);
- An assessment of existing environmental monitoring data (see Section 3.3);
- A summary of current Actinide Migration Studies findings with cross-links to the source evaluations (see section 3.4);

- Matrix of hypotheses for source location(s) with supporting and non-supporting information, including results on source location; and
- A detailed description of identified source areas.

5. SCHEDULE

Table 5-1. Schedule of Deliverables for the FY98 POE SW027 Source Evaluation.

Deliverable	Completion Date
Source Evaluation Report for Point of Evaluation SW027	October 29, 1998



Figure 2-1
RFETS Surface Water
POEs and POCs

Monitoring Location Objective*

- Point of Compliance
- Point of Evaluation

Standard Map Features

- Buildings and other structures
- Solar evaporation ponds
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Rocky Flats boundary
- Paved roads

DATA SOURCE:
Buildings, roads, and fences provided by
Facilities Engr.,
EG&G Rocky Flats, Inc. - 1991.
Hydrology provided by
USGS - (date unknown)

Scale = 1 : 12180
1 inch represents approximately 1018 feet

State Plane Coordinates Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:

Rocky Mountain
Remediation Services, LLC
Geospatial Information Systems Group
Rocky Flats Environmental Technology Site
14150 W. 10th Avenue
Golden, CO 80402-0464

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